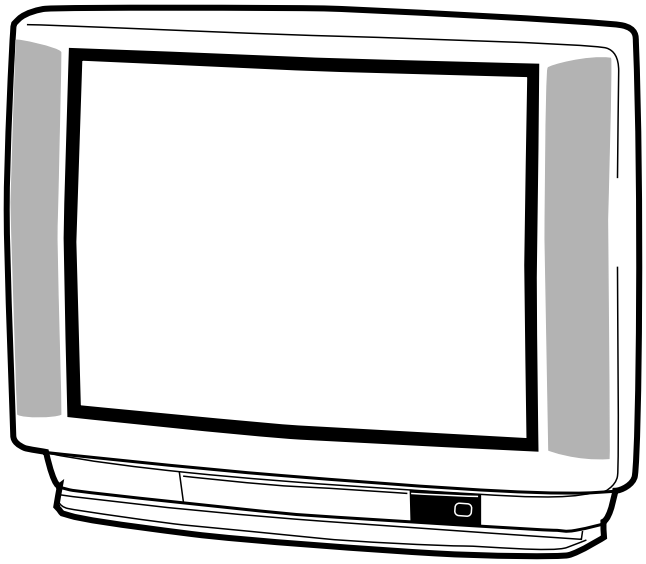
AV-28BK5ECB
AV-28BK5ECS

JVC

SERVICE MANUAL

COLOUR TELEVISION

AV-28BK5ECB
AV-28BK5ECS



SPECIFICATIONS:

Power source	AC 220~240V 50Hz
Power consumption(watts)	Maximum : 155 Average : 120 Standby : 1.5
Television system	CCIR B/G
Colour system	PAL on Air PAL/NTSC3.58/NTSC4.43 in AV mode
Channel coverage	E2-E12, E21-E69, S1-S41, X, Y, Z, Z+1, Z+2, A-H, H+1, H+2
Sound-multiplex systems	A2 (B/G) system
Teletext systems	FLOF (Fastext), TOP, WST (World Standard System)
AV terminal	
21-pin terminals	AV1: CENELEC Standard with RGB AV2: CENELEC Standard with S-inputs
Front AV terminals	AV3: RCA Terminal, Video and Audio(L/R) Input

Sound output (watts)	Rated Power output :5.0 x 2
Picture tubes (cm)	66 (measured diagonally)
Headphone jack	Stereo mini-jack (3.5 mm in diameter)
Speakers (cm)	(5 x 9)oval x 2
Dimensions (WxHxD mm)	736 x 595.5 x 500
Weight (kg)	32.5
Accessories	Remote control handset x 1 AAA/R03 dry cell battery x 2

Specifications subject to change without notice.

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No. 51758
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SAFETY PRECAUTION

1: An isolation transformer should be connected in the power line between the receiver and the AC line when a service is performed on the primary of the converter transformer of the set.
2: Comply with all caution and safety-related notes provided on the cabinet back, inside the cabinet, on the chassis or the picture tube.
3: When replacing a chassis in the cabinet, always be certain that all the protective devices are installed properly, such as, control knobs, adjustment covers or shields, barriers, isolation resistor-capacitor networks etc.Before returning any television to the customer, the service technician must be sure that it is completely safe to operate without danger of electrical shock.

X-RADIATION PRECAUTION

The primary source of X-RADIATION in the television receiver is the picture tube. The picture tube is specially constructed to limit X-RADIATION emissions. For continued X-RADIATION protection, the replacement tube must be the same type as the original including suffix letter. Excessive high voltage may produce potentially hazardous X-RADIATION. To avoid such hazards, the high voltage must be maintained within specified limit. Refer to this service manual, high voltage adjustment for specific high voltage limit. If high voltage exceeds specified limits, take necessary corrective action. Carefully follow the instructions for +B1 volt power supply adjustment, and high voltage adjustment to maintain the high voltage within the specified limits.

PRODUCT SAFETY NOTICE

Product safety should be considered when a component replacement is made in any area of a receiver. Components indicated by mark ⚠ in the parts list and the schematic diagram designate components in which safety can be of special significance. It is particularly recommended that only parts designated on the parts list in this manual be used for component replacement designated by mark ⚠ . No deviations from resistance wattage or voltage ratings may be made for replacement items designated by mark ⚠ .

CHASSIS DESCRIPTION

[Chassis Block Diagrams]

This is a basic diagram for all models and therefore differs slightly from the actual block diagram.

Outline

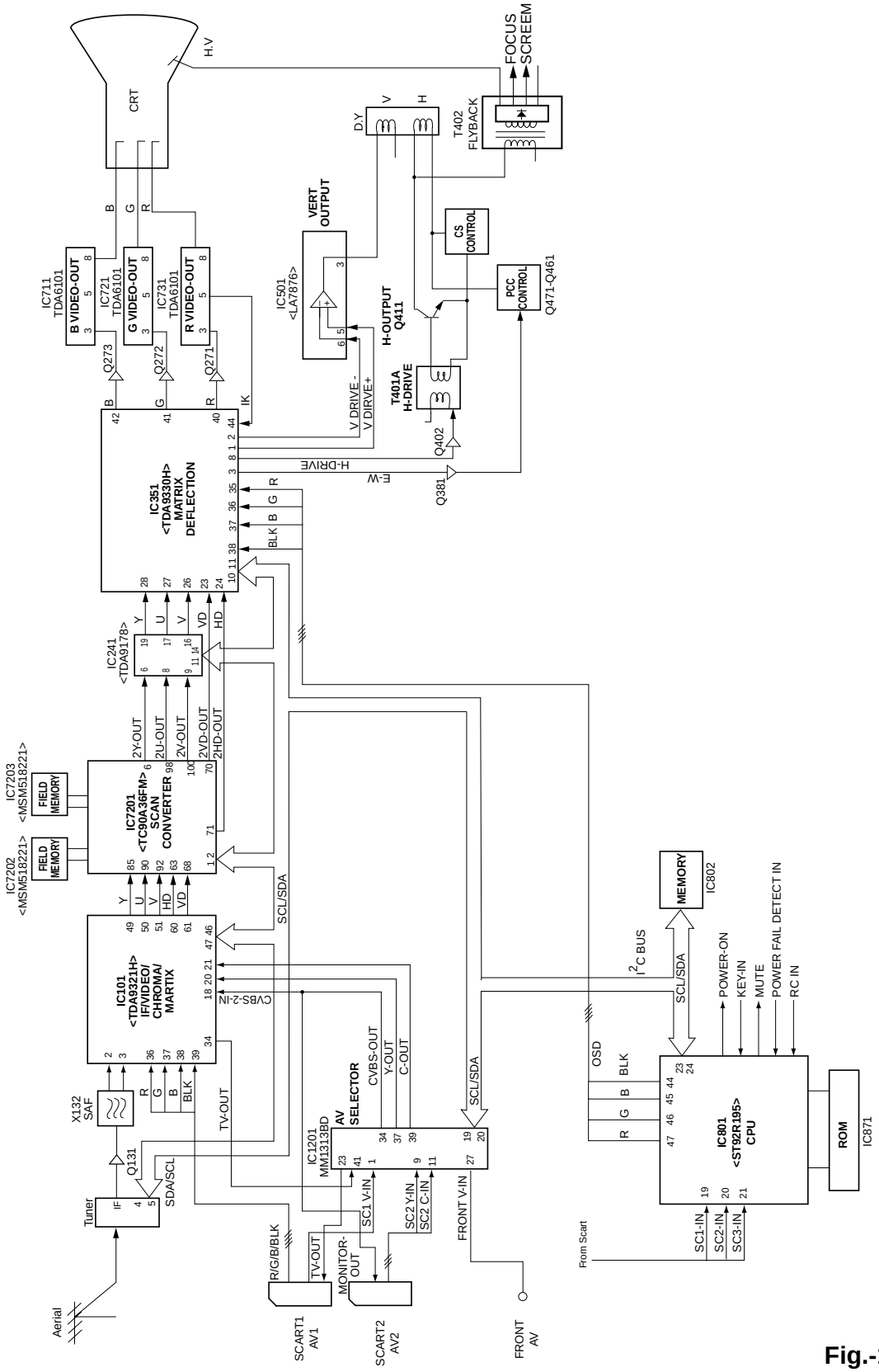


Fig.-1

Video signal rooting

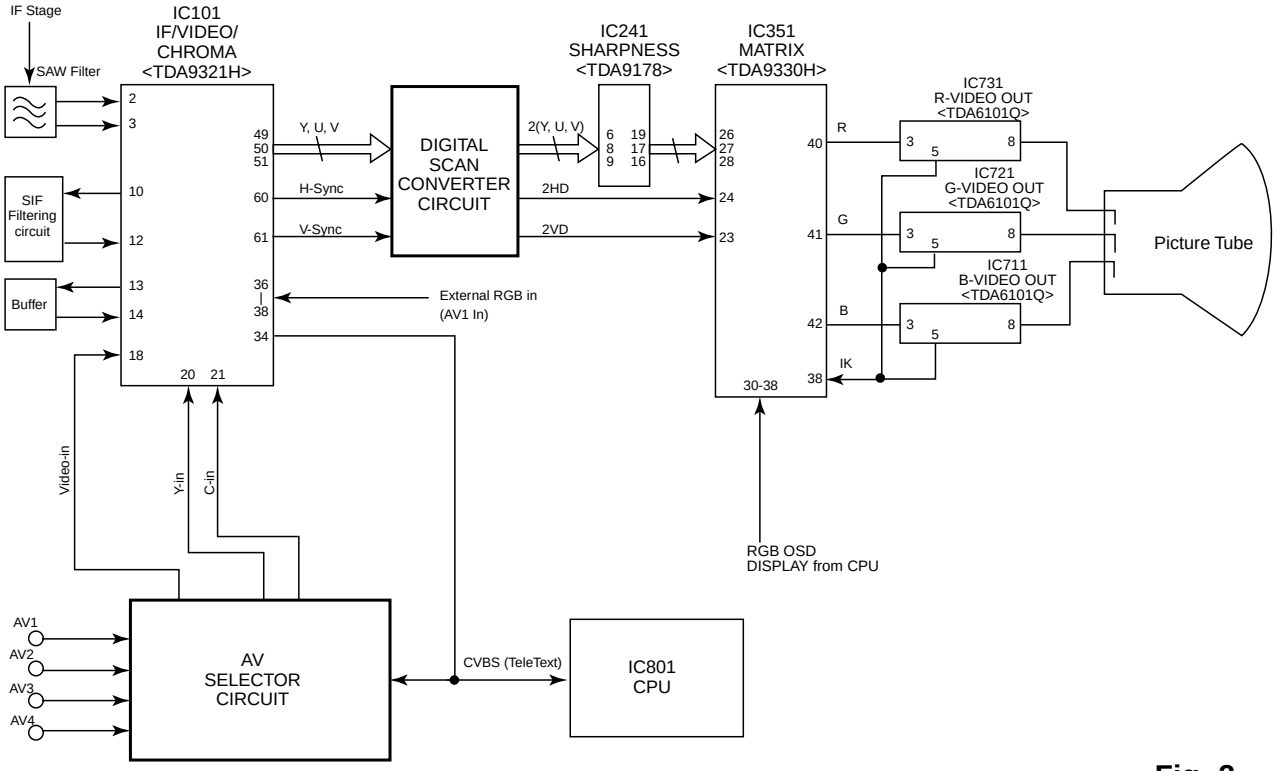


Fig.-2

Audio signal rooting

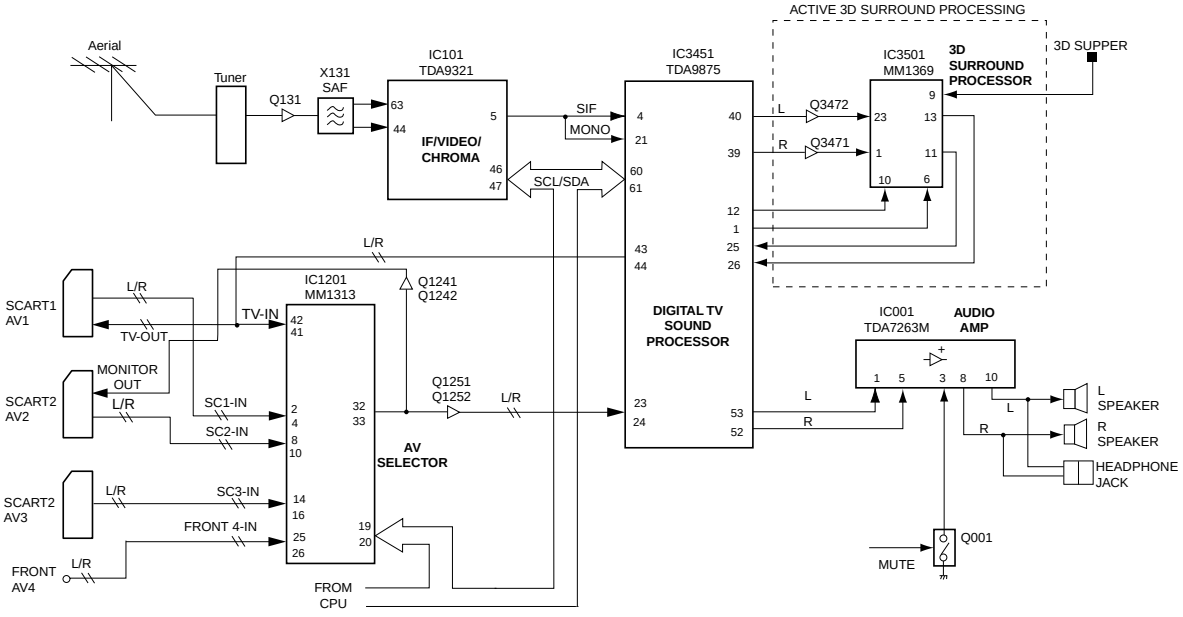


Fig.-3

System control

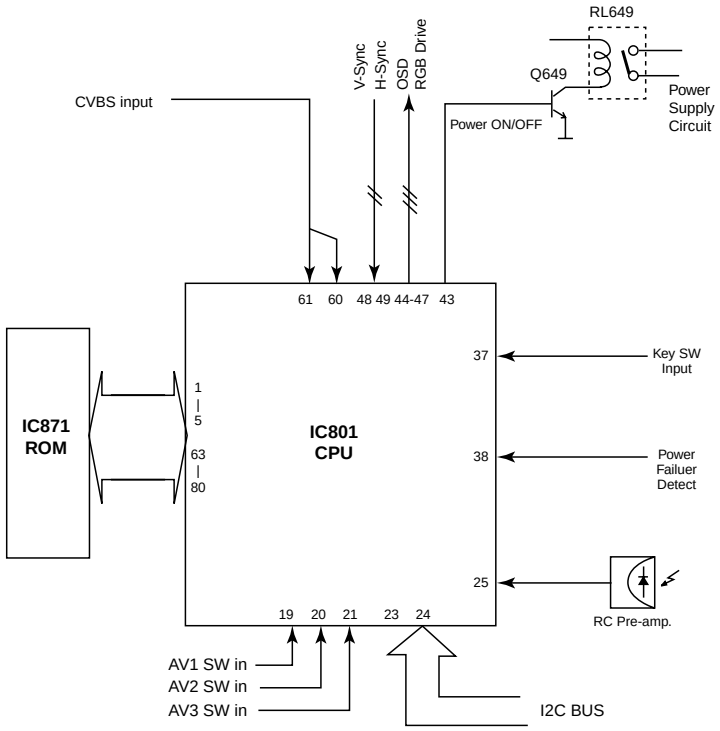


Fig.-4

Deflection circuit

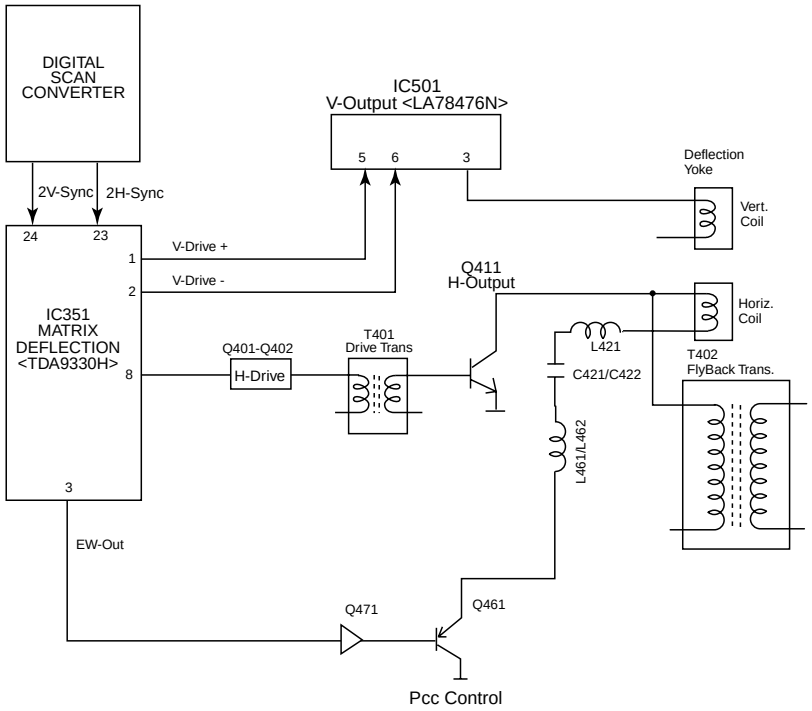


Fig.-5

[Digital Scan Operation]

100Hz Digital Scan Converter circuit

100Hz converter circuit consists of the following ICs.
- TC90A36F, IC7201
  Field Progressive Converter
- MSM518221A, IC7202, IC7203
  Video Memory
- TLC2932I, IC7204, IC7205
  PLL (Phase Locked Loop)
- MC74HC04AFP, IC7341
  invertor

The Y-signal output from IC101 is sent to pin 85 of IC7201<TC90A36F>, field progressive converter, after controlling the amplitude level and band-pass limiting by the circuit consist of Q7301, Q7302, Q7303, Q7304 and 8MHz LPF. The U/V-signal are also controlling the amplitude level and band-pass limiting by the circuit consist of Q7311, Q7312, Q7313, Q7314, Q7321, Q7322, Q7323, Q7324 and 4MHz LPF respectively. The U-signal is sent to pin 90 of IC7201and the V-signal is sent to pin 92 of IC7201. The HD signal is sent to pin 63 of IC7201 with positive polarity through IC7341 for shaping the waveform. The VD-signal is sent to pin68 of IC7201 with negative polarity through IC7341.
The Y-signal input to IC7201 is converted from A to D in 8bit and output from pins 31 to 50 of IC7201 to pins 1 to 4 and 24 to 27 of IC7203<MSM51822A>, video memory, for writing.

Digital scan circuit

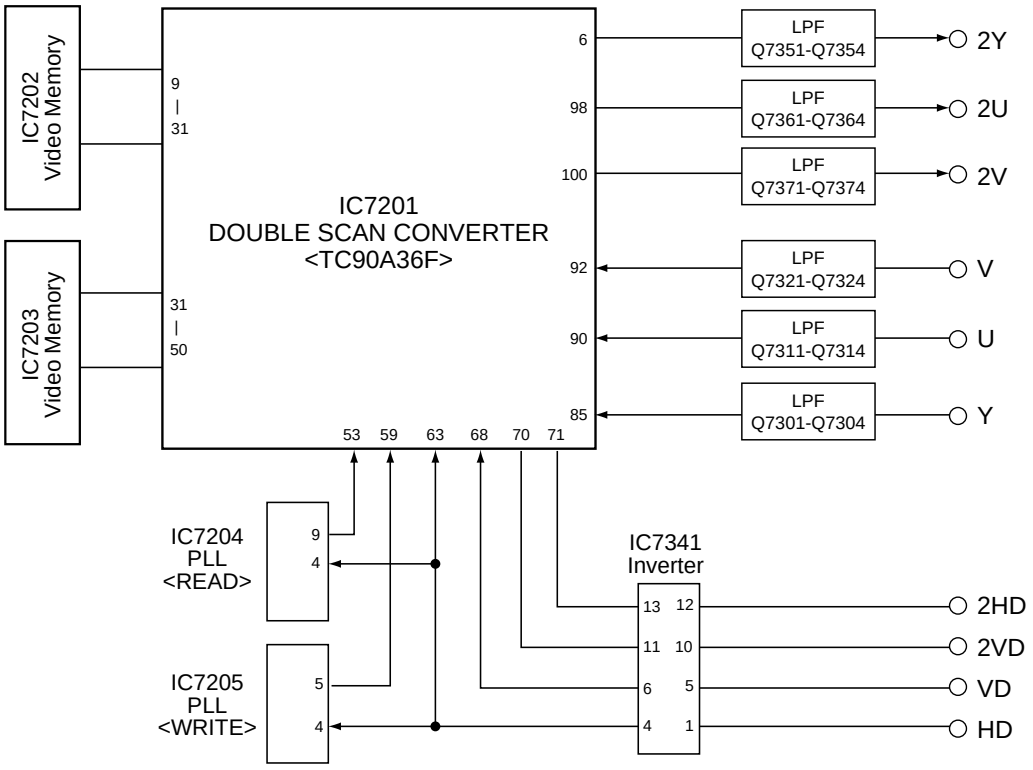
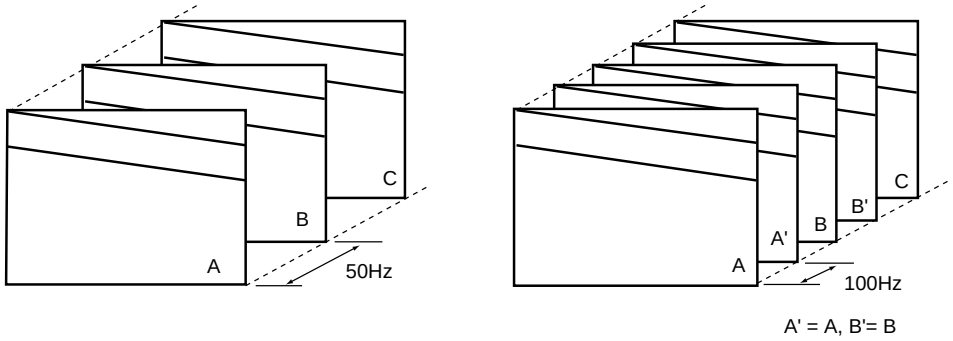


Fig.-6



(a) Normal Scan (b) Double Scan **Fig.-7**

The U/V-signals are converted in progressive at multiplexer and converted from A to D in 8 bit, and then applied from pins 34 to 41 of IC7201 to pins 1 to 40 and 24 to 27 of IC7203 <MSM518221A>, video memory, for writing.
The signals are wrote down to memory IC by 16MHz clock. It means the number of sampling are 1024 per 1H. The clock signal for writing is obtained by performing the phase comparing AFC control to the HD-signal. The phase comparing AFC control performs at IC7205<TLC2932I>, PLL, and IC7201. The 32MHz clock signal generated here is supplied from pin 3 of IC7205 and sent to pin 61 of IC7201. The clock signal divided to 16MHz in the IC is output to pin 31 and supplied to pins 6 of IC7202 and IC7203.
The reading is performed by 32MHz clock supplied from pin 28 of IC7201. In this case, the number of sampling is 2048 per 1H. This read clock signal is obtained by performing the frequency comparing AFC control to the input HD-signal. To avoid the skew distortion, the phase comparing AFC control is not employed. The frequency comparing AFC control is performed at IC7204<TLC2932I>, PLL, and IC7201. The 32MHz clock signal generated here is output from pin 3 of IC7205 and sent to pins 56 of IC7201 and IC7203.
The Y/U/V-signals are converted in progressive as the writing for 16MHz and reading for 32MHz. The progressive V-signal output from pins 10 to 13 and 15 to 18 of IC7202 is supplied to pins 9 to 16. Also, the progressive U/V-signals output from pins 10 to 13 and 15 to 18 of IC7203 are supplied to pins 43 to 50 of IC7201 and separated with U-signal and V-signal. And then, Y/U/V-signals are converted in D to A in IC7201 and output to pin 6 as analogue Y-signal, pin 98 as analogue V-signal and pin 100 as analogue V-signal respectively. The HD-signal progressive converted in IC7201 is output from pin 71 of IC7201, the VD-signal progressive converted in IC7202 is output from pin 70 of IC7201. The output HD and VD signals are sent to IC202 with positive polarity through the IC7341 for waveform shaping.
The Y-signal output from IC7201 is controlled the amplitude level and band-pass limiting at the circuit consist of Q7351, Q7352, Q7353, Q7354 and 16MHz LPF. The U/V-signals are also controlled the amplitude level and band-pass limiting at the circuit consist of Q7361, Q7362, Q7363, Q7364, Q7371, Q7372, Q7373, Q7374 and 8MHz LPF and these signals are sent to IC201.

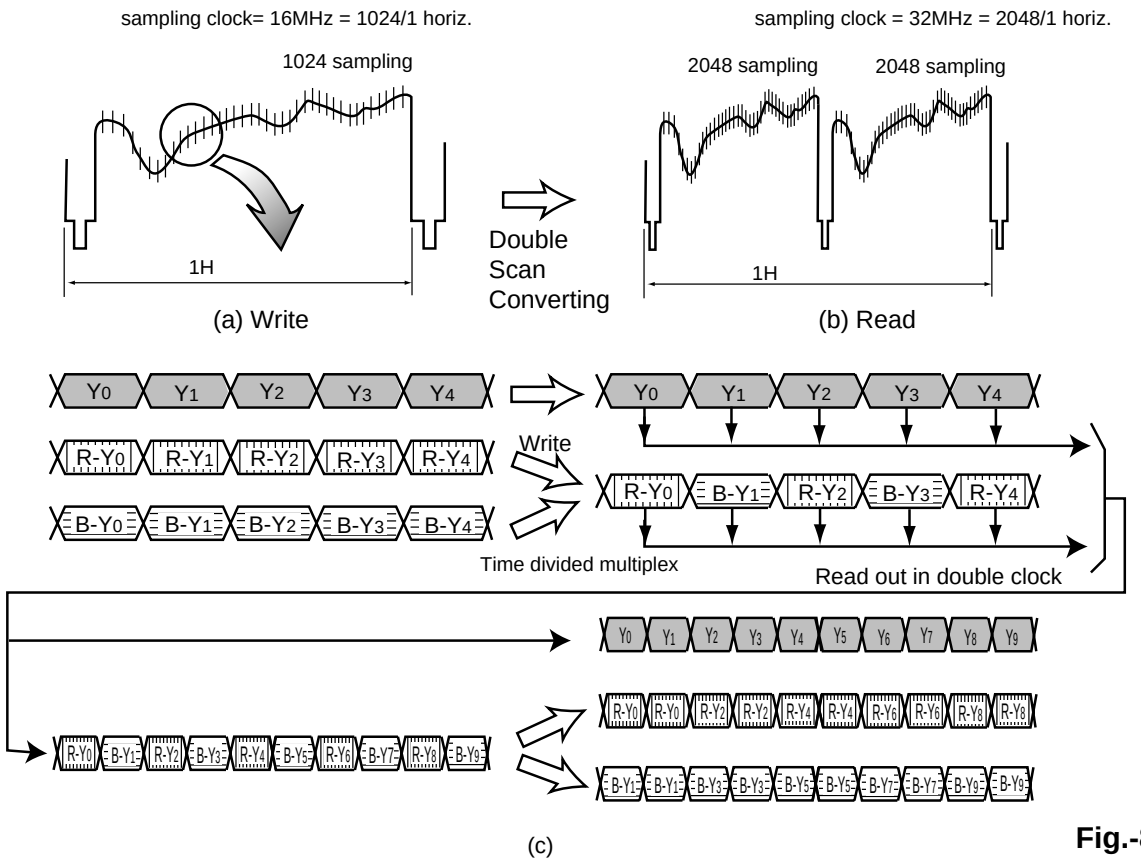

sampling clock= 16MHz = 1024/1 horiz.
sampling clock = 32MHz = 2048/1 horiz.
1024 sampling
2048 sampling
2048 sampling
1H
1H
Double
Scan
Converting
(a) Write
(b) Read
Y0 Y1 Y2 Y3 Y4
R-Y0 R-Y1 R-Y2 R-Y3 R-Y4
B-Y0 B-Y1 B-Y2 B-Y3 B-Y4
Write
Time divided multiplex
Read out in double clock
(c)

Fig.-8

Power supply & Protection circuit

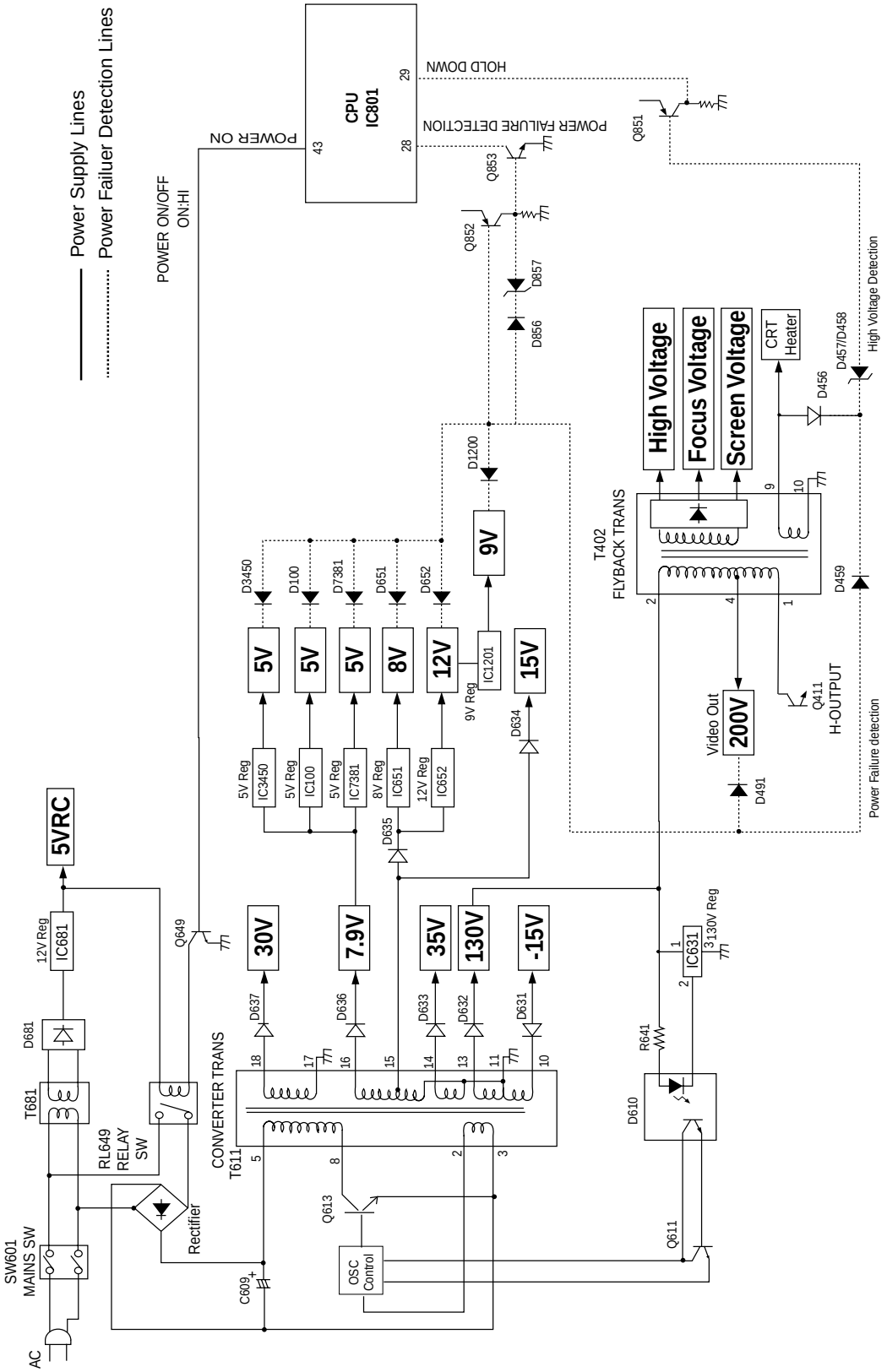
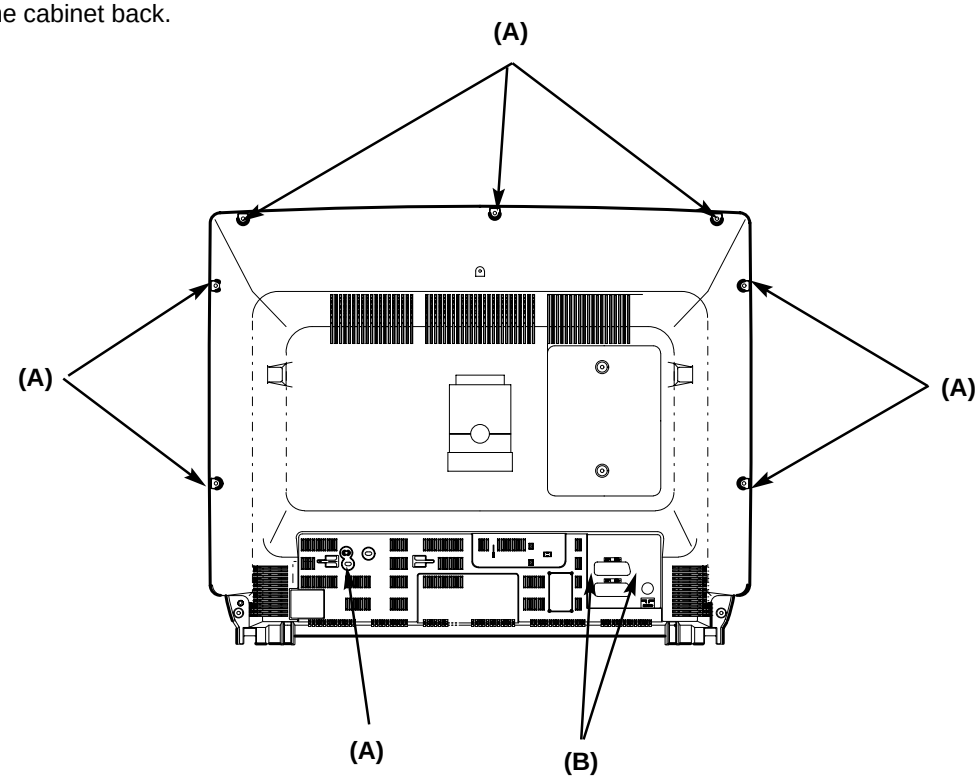


Fig.-9

CABINET BACK DISASSEMBLY

1. Remove 8 screws (A) and 2 screws(B).
2. Pull out the cabinet back.



OPTION SETTINGS

This TV set allows to set up the following option settings.

■ PROHIBITION

Prohibit the presetting and sets the current volume as the maximum volume level.

PROHIBITION OFF or ON

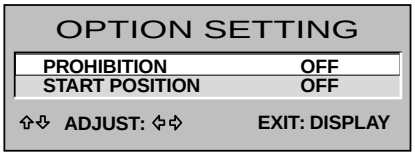
■ START POSITION

Presets the programme position when the set is switched on.

START POSITION OFF	Last programme position start
POS1	Programme position "1" start
POS2	Programme position "2" start
POS3	Programme position "3" start
POS4	Programme position "4" start
POS5	Programme position "5" start
POS6	Programme position "6" start
POS7	Programme position "7" start
POS8	Programme position "8" start
AV1	"AV1" start

SETTING PROCEDURE

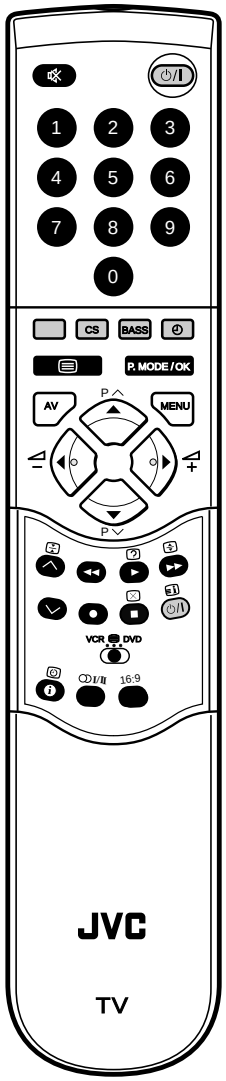
1 Enter the option setting mode. Press and hold the ⓘ **button** on the **remote control handset** and then press the **P▲ button** on the TV set. Following option setting window will appear on the screen.

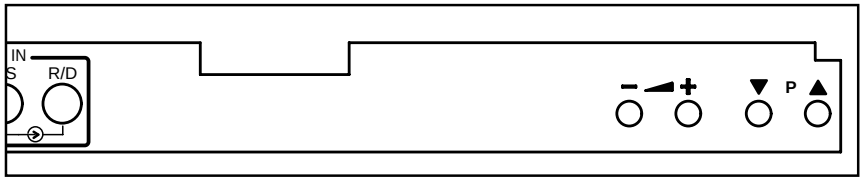


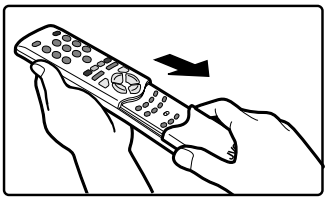
2 Use the **P▲** (▲) or **P▼** (▼) **button** to highlight the desired function item from the menu, and to select the mode by pressing the ◄ or ► **button**.

3 To return to the normal TV mode, press the ⓘ **button**.

- When setting the maximum volume, set the current sound volume as the maximum volume level before entering the option setting mode.
- This option setting functions are not cancelled if the TV set is switched off or the mains disconnected.







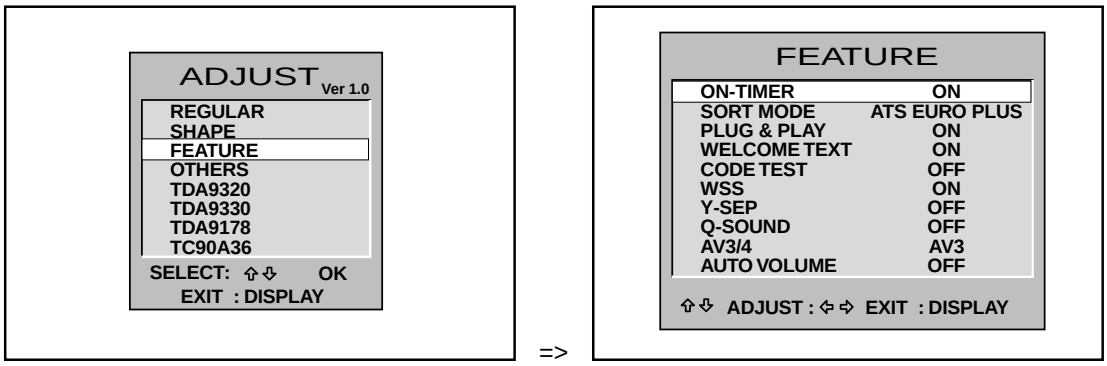
SERVICE ADJUSTMENTS

[After replacing the Menory IC (IC802)]
The memory IC, IC802, stores the feature setting data of TV set and service adjustments data for each circuit, therefore, when the memory IC is replaced, it should be performed by following “FEATURE SETTING” and “ADJUSTMENT”.

[FEATURE SETTING]

To enter to the Feature Setting Mode

+ Press and hold the ⓘ **button** and 🔇 **button** on the **remote control handset**. The adjustment window will appear on the screen.
+ Highlight the **FEATURE** menu by using the ▲ or ▼ **button** and then press the **P.MODE/OK button**. The window will change to the feature setting window.



To set the feature mode

+ Highlight the desired feature item by using the ▲ or ▼ **button**.
+ To change the feature mode, use the ◄ or ► **button**.
+ The data which is set in the feature mode is stored into the memory IC automatically.

Following table shows the available feature items and default setting. (The features of item Y-SEP, Q-SOUND and AV3/4 do not operate properly even if the mode can be set to “ON” or “AV4”.)

Feature items	Mode	Description & Note
ON-TIMER	ON or OFF	On-timer available, default “ON”
SORT MODE	ATS EURO PLUS	Tuning mode, default “ATS EURO PLUS”
	or AUTO TUNE	
	or AUTO TUNE/SORT	
PLUG & PLAY	ON or OFF	Plug & Play mode,default “ON”
WELCOME TEXT	ON or OFF	Display message when first set up, default “ON”
CODE TEST	OFF or ON	For factory use, default “OFF”
WSS	OFF or ON	Wide Screen Signaling available , default “OFF
Y-SEP	OFF or ON	Y-Separation function available, default “OFF”
Q-SOUND	OFF or ON	Active 3D Surround available, default “OFF”
AV3/4	AV3 or AV4	No. of AV input mode, default “AV3”
AUTO VOLUME	OFF or ON	Auto Volume function available, default “OFF”

Exit from the Feature Setting Mode

+ Press the ⓘ **button** on the remote control.

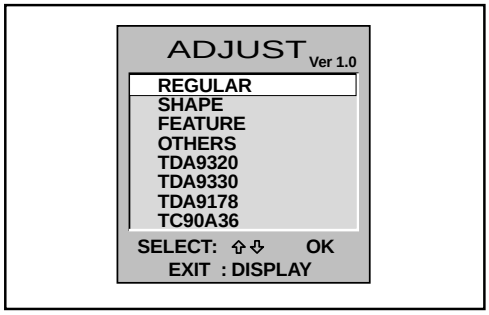
[ADJUSTMENT MODE]

Note: Some items of the service adjustments for this chassis are controlled by the CPU, IC801, and the adjustments are carried out by using the RC handset.

IMPORTANT NOTICE
Do not attempt to adjust service adjustments not listed on the above otherwise it may cause loss of performance and product safety.

To enter to the Service Mode

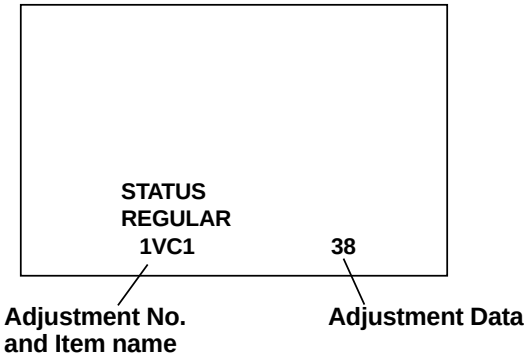
+ Press and hold the ❶ **button** and 🔇 **button** on the **remote control handset**. The adjustment window will appear on the screen.



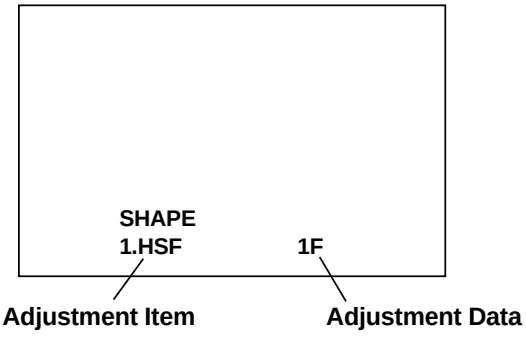
To select the mode and service item and change data value

+ Highlight the desired adjustment mode (**REGULAR** or **SHAPE** mode **)** by using the ▲ or ▼ **button** and then press the **P.MODE/OK button**.
+ To select the adjustment item, use the ▲ or ▼ **button**.
+ To change the service data, use the ◀ or ▶ **button**.
+ The data which is set in the service mode is stored into the memory IC automatically.

REGULAR mode



SHAPE mode



[ADJUSTABLE SERVICE ADJUSTMENT]

IMPORTANT NOTICE

Do not attempt to change the data value of service items not listed below table otherwise it may cause loss of performance and product safety. If you can not restore the data value of each service item, please initialize the memory IC following to the below description “INITIALIZATION OF MEMORY IC” and re-adjust all of service adjustments.

[REGULAR]

Item No.	OSD	Description	
1	1VC1	B/G VCO Adjustment	
2	2VC2	France-L/L’ VCO Adjustment	-- Not required for this model
3	3AGC	AGC Adjustment	
4	4SCR	Screen Adjustment	
5	5GRY	White Balance (high light) Adjustment	
6	6CUT	Cut-Off Drive Adjustment	-- Do not adjust
7	7CTR	Contrast Adjustment	
8	8OSD	OSD Positioning Adjustment	

[SHAPE]

Item No.	OSD	Description
1	1.HSF	Horizontal Centre Adjustment
3	3.EWW	Horizontal Width Adjustment
4	4.EWP	Pcc Adjustment
9	9.VAM	Vertical Height Adjustment
13	13.VSC	Vertical Centre Adjustment

Exit from the Service Mode

+ Press the ⏻ **button** on the remote control or turn off the TV set by using the Mains switch.

[INITIALIZATION OF MEMORY IC]

To initialize the memory IC (IC802), press and hold the **P.MODE/OK button** and then press the **P▲ button** on the front control panel, **and then turn the Mains switch Off and On**. Now the initialization is completed.
When initialized the memory IC, all of the setting data (feature setting data, option data and service adjustment data) stored in the IC are reset to the default value. So it is necessary to set the feature setting, option setting and readjust the service adjustments listed on pages 11 to 14.

[RESTORE THE SELF TUNING SYSTEM]

This TV set provides a self-automatic tuning system function called “Plug & Play”. The first time you switch on this TV set, it will automatically begin to search and store all available channels. To restore this function, follows below steps.

1. Disconnect the aerial socket.
2. Press the MENU button and select PRESET menu, and then press the P.MODE/OK button.
3. Select ATS EURO PLUS menu and press the P.MODE/OK button. The automatic tuning will start.
4. Turn off the Mains Switch on the TV front immediately before the TV receives and stores any of the signals.

Next time the TV set is turned on, the self automatic tuning system will start.

[ADJUSTMENT]

How to adjust the each service data, please see “ADJUSTMENT MODE” on page 13 for entering the service mode , selecting service item and adjusting the service data value.

IMPORTANT NOTICE

Do not attempt to adjust the following service adjustments except requiring the readjustments in servicing otherwise it may cause loss of performance and product safety.

IF VCO ADJUSTMENT

PAL BG VCO ADJUSTMENT

1. Apply 38.9MHz signal with 90 ±10dBuV/75Ω terminated to IF terminal on the tuner.
2. Enter to the service mode and select mode “REGULAR”, item “REGULAR 1VC1”.
3. Press the ◄ or ► **button** to set data value to be “10”.

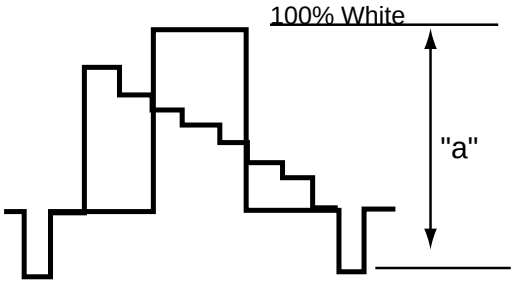
RF-AGC ADJUSTMENT

1. Receive colour bar pattern with 63dBuV/75Ω terminated signal gain.
2. Connect digital voltmeter to TP-AGC and GND.
3. Enter to the service mode and select mode “REGULAR”, item “REGULAR 3AGC”.
4. Press the ◄ or ► **button** to adjust voltage to be 3.2Vdc.

VIDEO LEVEL ADJUSTMENT

VIDEO LEVEL ADJUSTMENT-1

1. Receive colour bar pattern.
2. Connect oscilloscope to terminal TPVIDEO and GND.
3. Adjust amplitude “a” to be 2.0Vp-p by using VR221.



VIDEO LEVEL ADJUSTMENT-2

1. Receive colour bar pattern.
2. Connect oscilloscope to terminal 8 of K73A and GND. Connect oscilloscope to terminal 11 of K73B and GND.
3. Adjust the amplitude of waveforms to be same by using VR7351.

FOCUS ADJUSTMENT

Receive cross-hatch pattern and adjust focus by using FOCUS VR to obtain the defined vertical and horizontal lines.

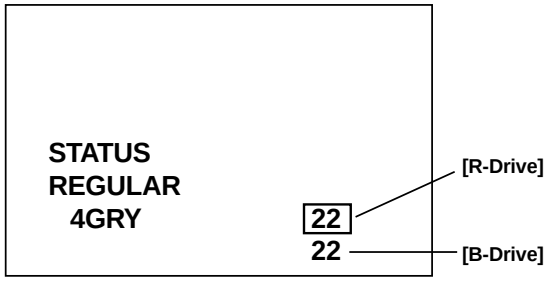
GREY SCALE ADJUSTMENT

SCREEN ADJUSTMENT

1. Select AV1 mode and no signal input.
2. Enter to the service mode and select mode “REGULAR”, item “REGULAR 4SCR”.
3. Check that mode is switched to AV and no signal inputs.
4. Turn the **SCREEN VR** to set data value to be “11”.

GREY SCALE ADJUSTMENT

5. Enter to the service mode and select mode “REGULAR”, item “REGULAR 5GRY”.
6. Adjust [R-Drive] and [B-Drive] control to obtain proper white balance by using ◄ or ► **button**.
   a) Select [R-Drive] or [B-Drive] by using the ▲ or ▼ **button**.
   b) Adjust [R-Drive] or [B-Drive] by using the ◄ or ► **button**.



Adjustable Range:
00 ~ 3F, 4F ~ 7F, 80 ~ BF, C0 ~ FF

*The cut off adjustment is not required for this model. The cut off adjustment is carried out automatically in the TV set itself.

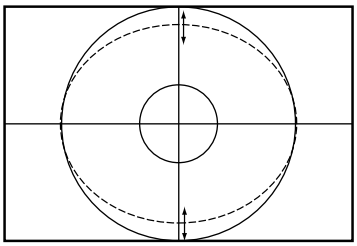
VERTICAL ADJUSTMENT

VERTICAL CENTRING ADJUSTMENT

1. Receive circular pattern.
2. Enter to the service mode and select mode “SHAPE, item “SHAPE 13.VSC”.
3. Press the ◀ or ▶ **button to** adjust vertical centre.

VERTICAL HEIGHT ADJUSTMENT

1. Receive circle (or cross-hatch) pattern .
2. Enter to the service mode and select mode “SHAPE”, item “SHAPE 9.VAM”.
3. Press the ◀ or ▶ **button** to adjust the vertical height.



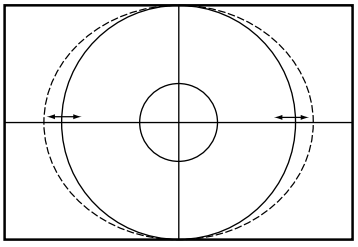
HORIZONTAL ADJUSTMENT

HORIZONTAL CENTRING ADJUSTMENT

1. Receive circle (or cross-hatch) pattern .
2. Enter to the service mode and select mode “SHAPE”, item “SHAPE 1.HSF”.
3. Press the ◀ or ▶ **button** to adjust horizontal centre.

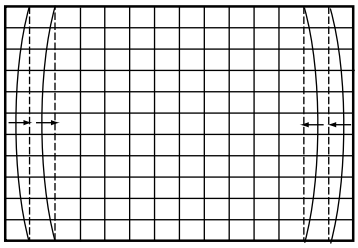
HORIZONTAL WIDTH ADJUSTMENT

1. Receive circle (or cross-hatch) pattern.
2. Enter to the service mode and select mode “SHAPE”, item “SHAPE 3.EWW”.
3. Press the ◀ or ▶ **button** to adjust the horizontal width.



PINCUSHION ADJUSTMENT

1. Receive circle (or cross-hatch) pattern.
2. Enter to the service mode and select mode “SHAPE”, item “SHAPE 4.EWP”.
3. Press the ◀ or ▶ **button** to adjust the vertical line to be straight.

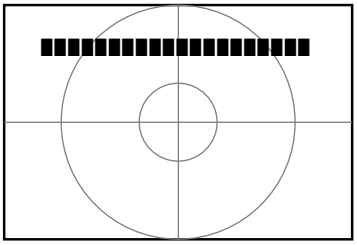


HIGH-VOLTAGE CONFIRMATION

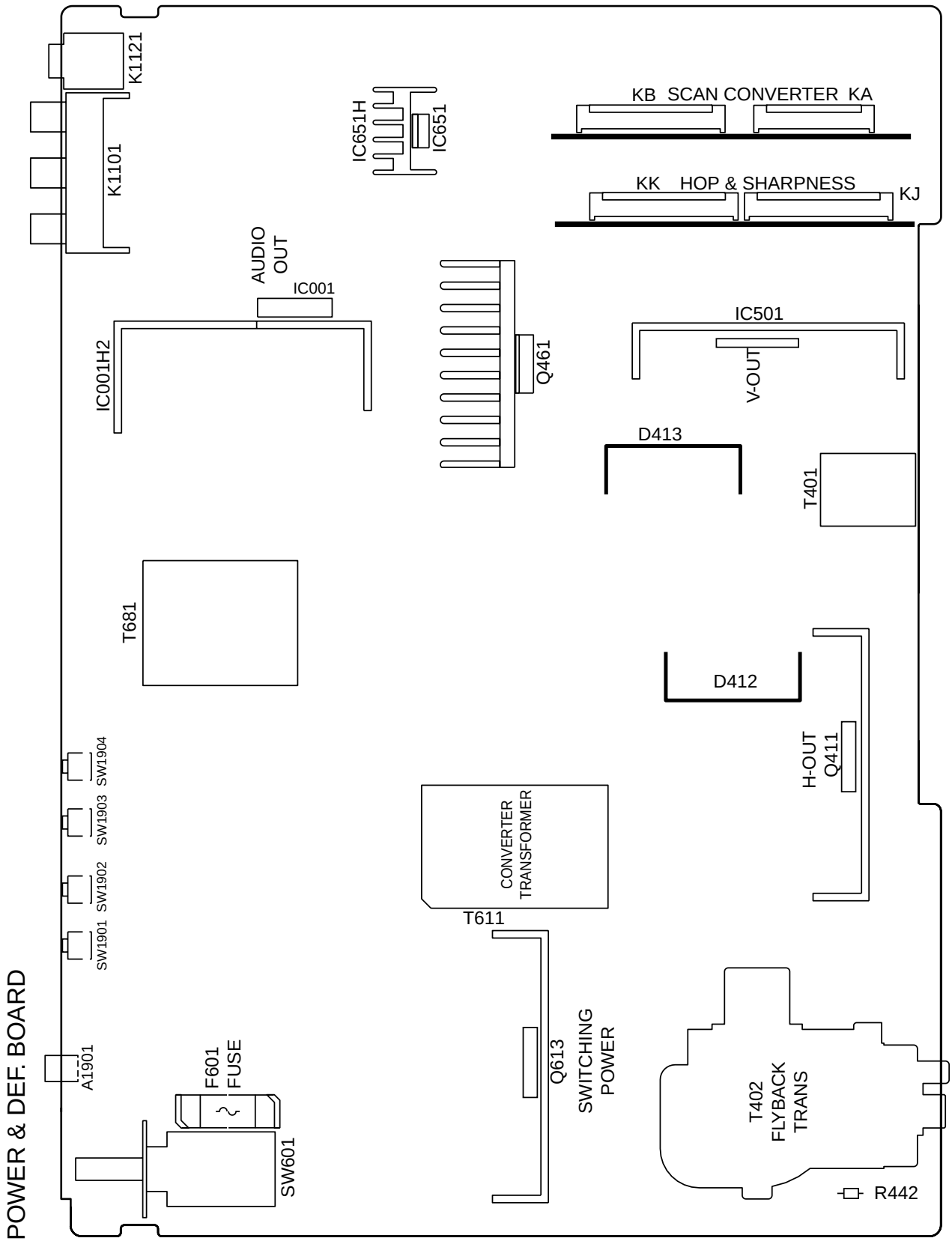
1. Receive circle (or cross-hatch) pattern.
2. Connect digital volt-meter to both terminals of R442, and high voltage meter to CRT anode.
3. Confirm high voltage to be 26.5KV ± 1 KV at beam current 1.4mA, and less than 29.5 KV at 0 beam current.

OSD CENTRING ADJUSTMENT

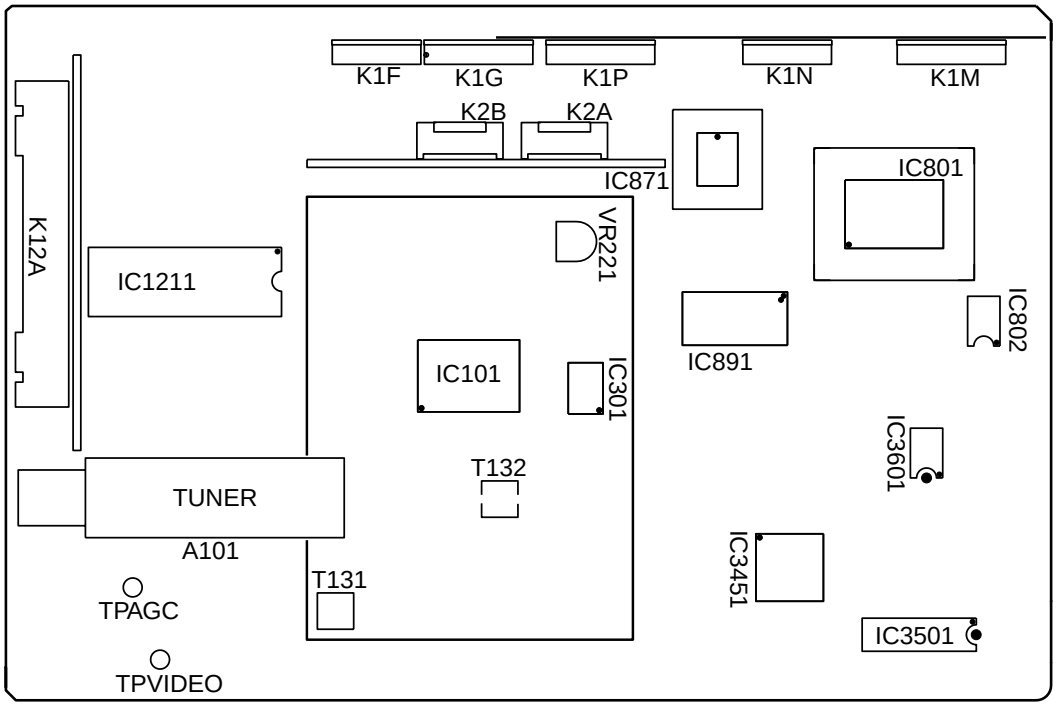
1. Receive circle (or cross-hatch) pattern.
2. Enter to the service mode and select mode “REGULAR”, and select item no. 8 “REGULAR 8 OSD”. The OSD test bar will appear on the top of screen.
3. Press the ◀ or ▶ **button** to adjust proper OSD positioning.



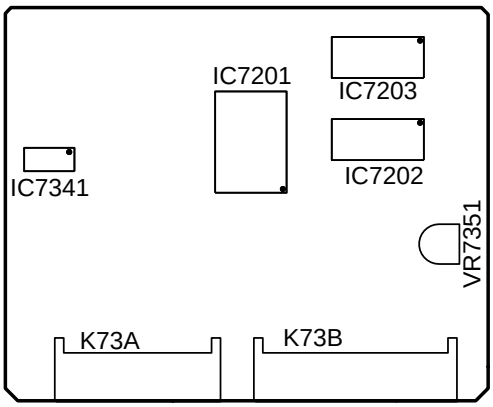
COMPONENT LOCATIONS



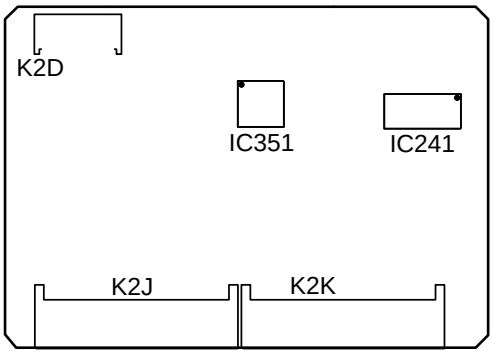
TU & SIGNAL BOARD



SCAN CONV. BOARD



HOP BOARD



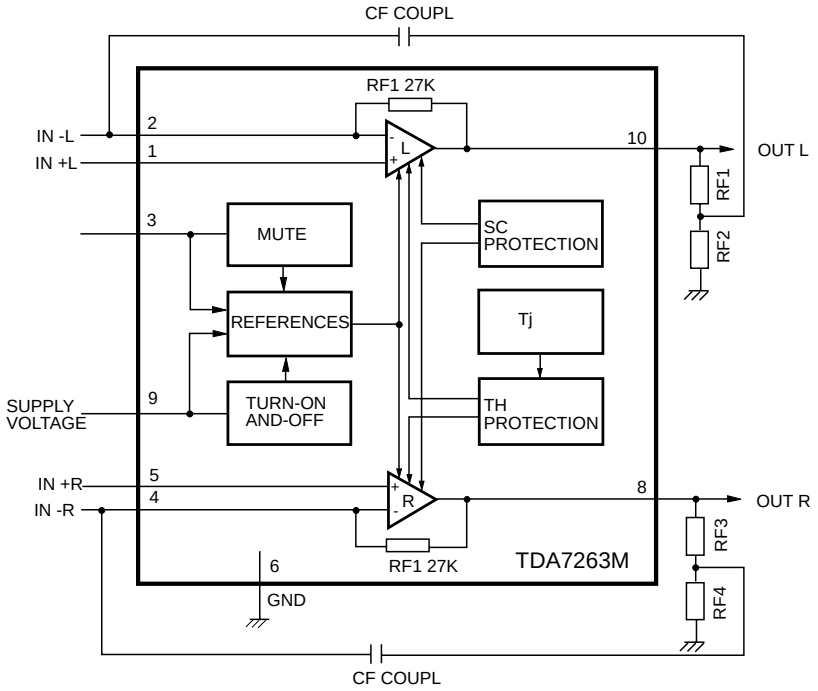
CPU PORT FUNCTIONS

Pin No.	Function Name	Function	IN/OUT
1	MMU0		OUT
2	MMU3		OUT
3	ADDR10	Address bus 10	OUT
4	DSN		
5	ADDR11	Address bus 11	OUT
6	ADDR9	Address bus 9	OUT
7	ADDR8	Address bus 8	OUT
8	RWN		
9	GND		
10	VDD		IN
11	OSC-IN	Clock Input	IN
12	OSC-OUT	Clock Output	OUT
13	ADDR13	Address bus 13	OUT
14	ADDR14	Address bus 14	OUT
15	MMU1		OUT
16	MMU2		OUT
17	MMU4		OUT
18	MMU5		OUT
19	SCART 3	SCART 3 Input H: AV	IN
20	SCART 2	SCART 2 Input H: AV	IN
21	SCART 1	SCART 1 Input H: AV	IN
22	FRONT SC SW	Front AV Switch Input H : Front	IN
23	SDA	IIC SDA	IN/OUT
24	SCL	IIC SCL	OUT
25	RC-IN	Remote Control Signal Input	IN
26	SERVICE IN	Service Switch Input On: L	IN
27	SERVICE ACK	External Bus Switch Output ACK: L	OUT
28	PROTECT	Power Failure Detection Input L: Failure	IN
29	Hold Down	Hold Down (High Voltage Detection Input) L: Hold Down On	IN
30	50/60	50/60Hz Switch Output 50: H 60: L	OUT
31	MUTE	Sound Mute Output On: H	OUT
32	SUPER 3D	Super 3D Switch Output On: L	OUT
33	Phone Mute	Phone Mute	OUT
34	VDD		IN
35	GND		
36	IF AGC	IF AGC Input	IN
37	KEY-IN	Key Input TV Key	IN
38	RF AGC IN	RF AGC Input	IN
39	NA		
40	NA		
41	LED-2	LED Drive Output	OUT
42	NA		
43	POWER	Power On/Off Drive H: Power-On	OUT
44	FB	BLK Output for OSD	OUT
45	B	Blue Output for OSD	OUT
46	G	Green Output for OSD	OUT
47	R	Red Output for OSD	OUT
48	V-SYNC	V-Sync Input	IN
49	H-SYNC	H-Sync Input	IN
50	WSCR		

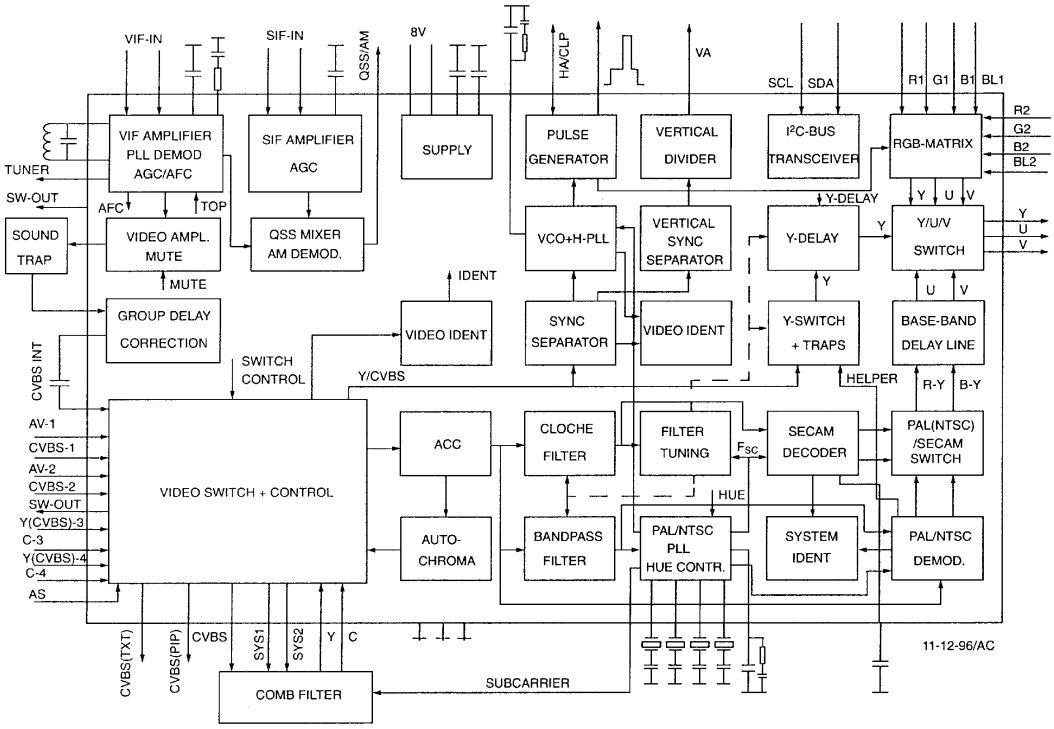
Pin No.	Function Name	Function	IN/OUT
51	WSCF		
52	VDD-A		IN
53	PXFM		
54	RESET	Reset Input	IN
55	MCFM		
56	JTRSTO		
57	TXCF		
58	CVBS0		
59	TEST0		
60	CVBS1		
61	CVBS2		
62	GND-A		
63	DAT3	Data bus 3	IN
64	DAT4	Data bus 4	IN
65	DAT5	Data bus 5	IN
66	DAT6	Data bus 6	IN
67	DAT7	Data bus 7	IN
68	DAT2	Data bus 2	IN
69	DAT1	Data bus 1	IN
70	DAT0	Data bus 0	IN
71	ADDR0	Address bus 0	OUT
72	ADDR1	Address bus 1	OUT
73	ADDR2	Address bus 2	OUT
74	ADDR3	Address bus 3	OUT
75	ADDR4	Address bus 4	OUT
76	ADDR5	Address bus 5	OUT
77	ADDR6	Address bus 6	OUT
78	ADDR7	Address bus 7	OUT
79	ADDR12	Address bus 12	OUT
80	ADDR15	Address bus 15	OUT

IC BLOCK DIAGRAMS

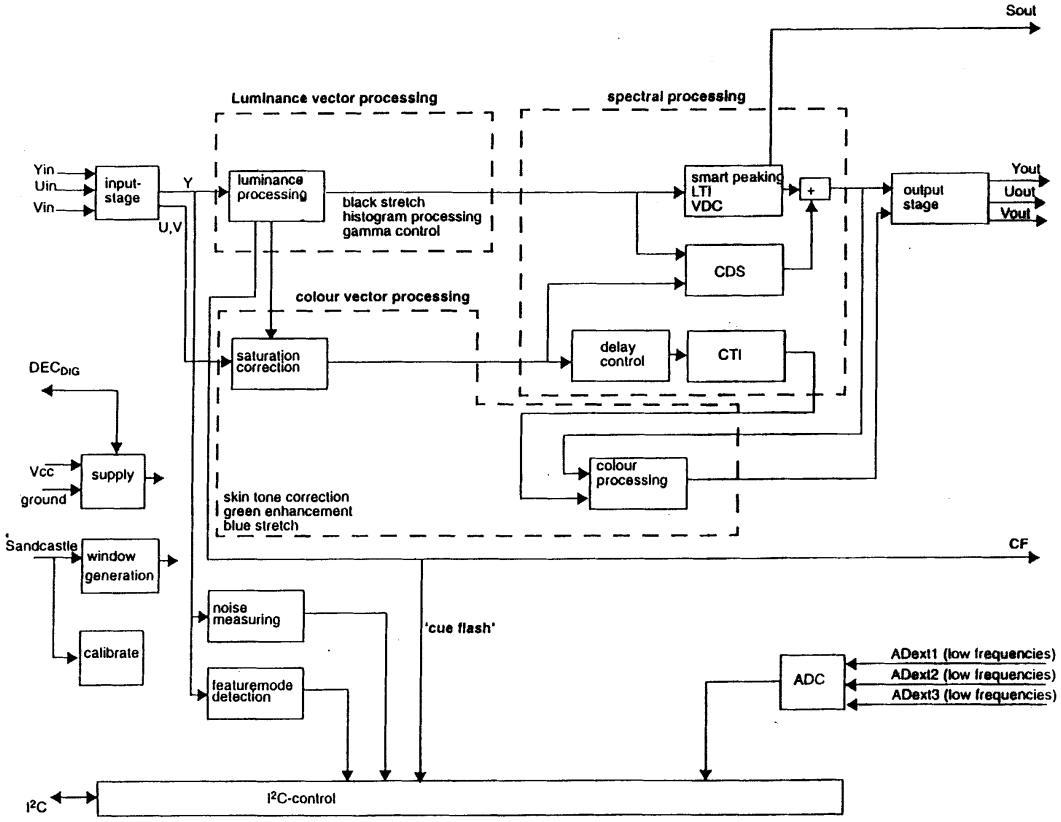
IC001 TDA7263M <Audio Output>



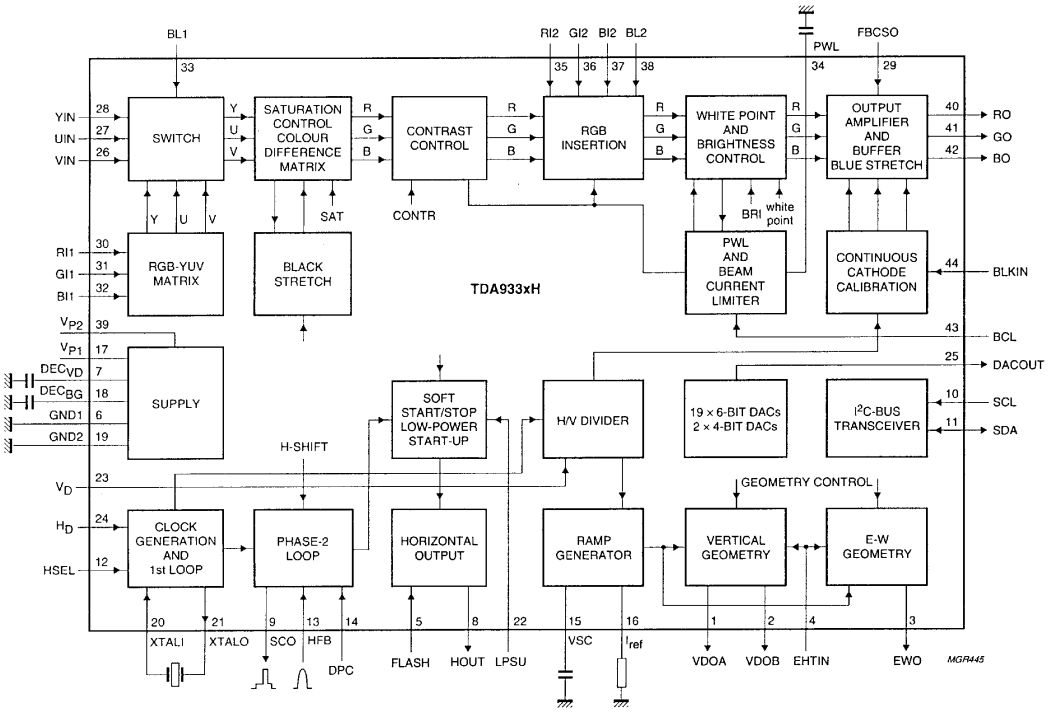
IC101 TDA9321H <IIC bus controlled TV input processor>



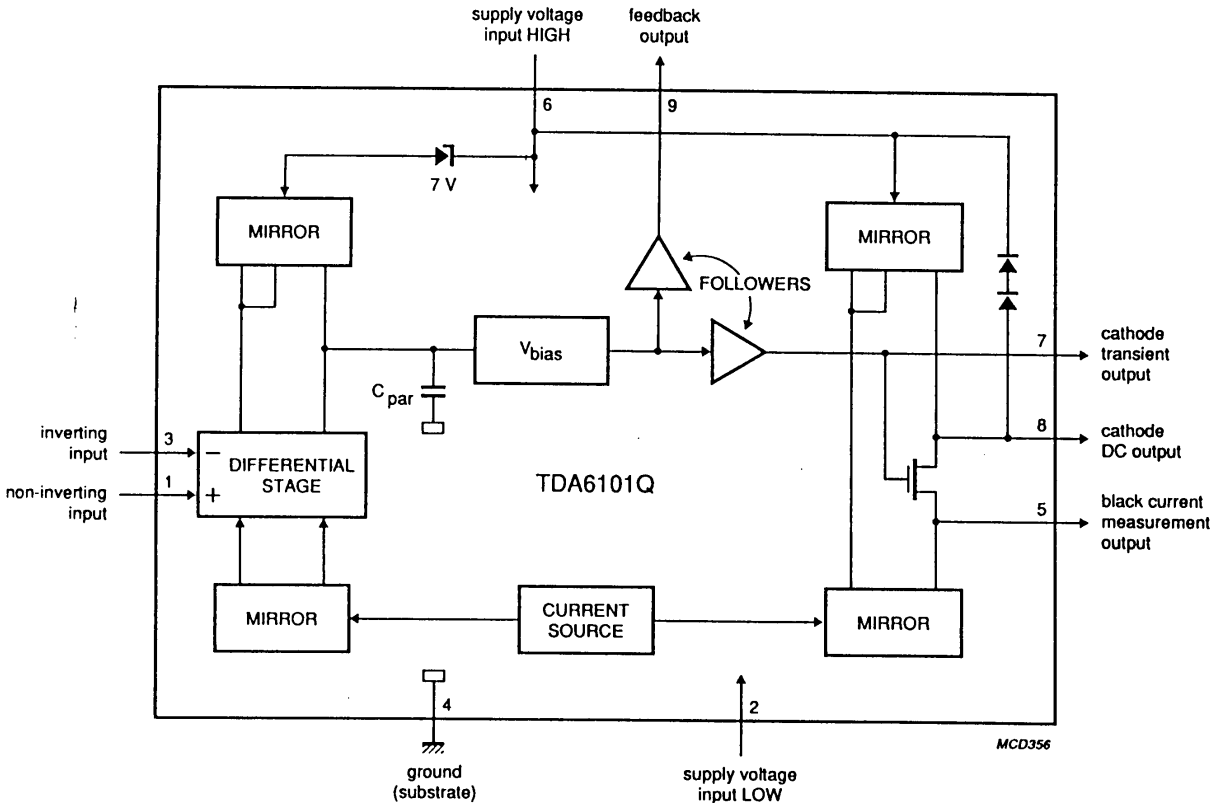
IC241 TDA9178T <YUV Picture Improvement>



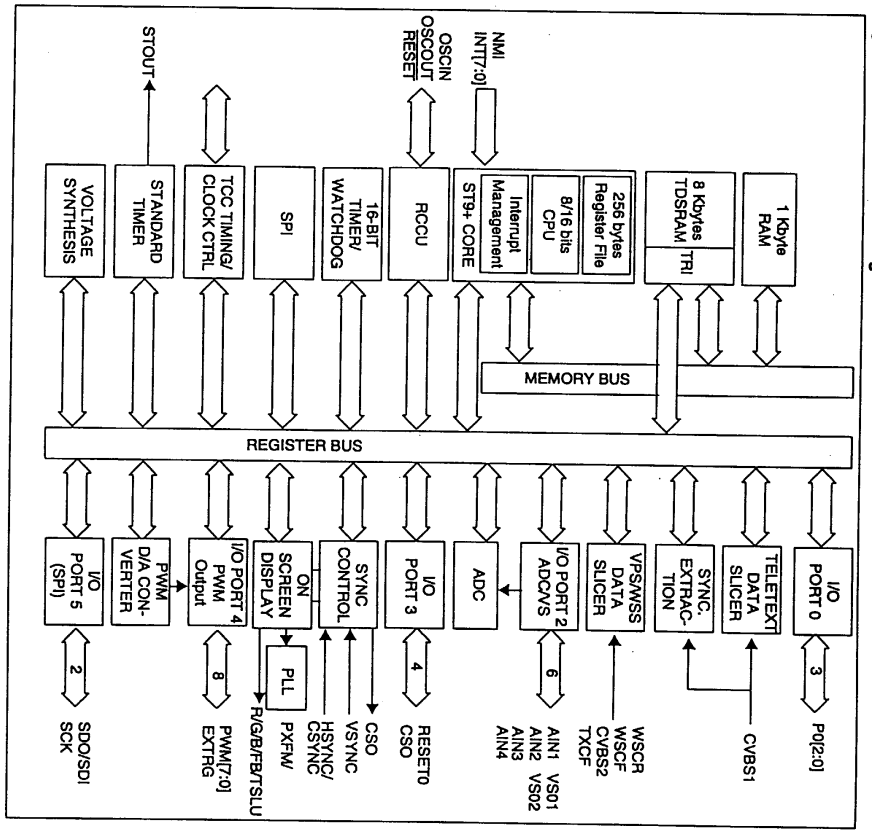
IC351 TDA9330H <IIC bus controlled TV display processor>



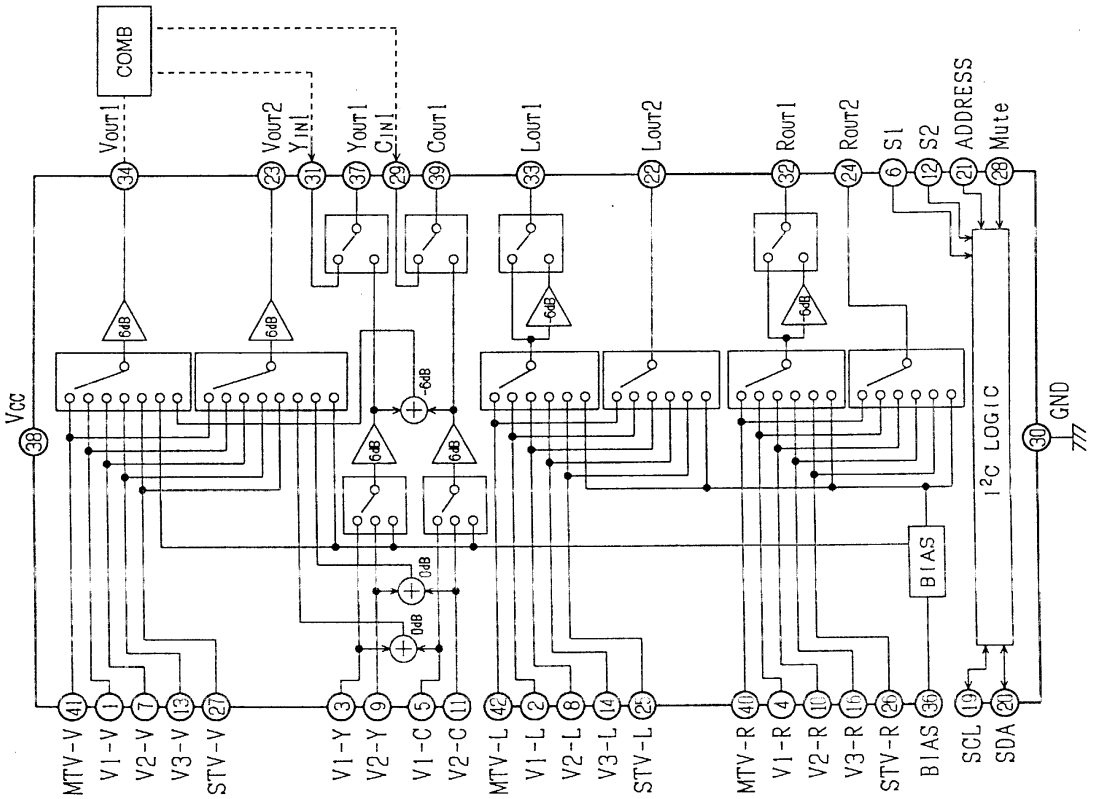
IC711, IC721, IC731 TDA6101Q <Video Output>



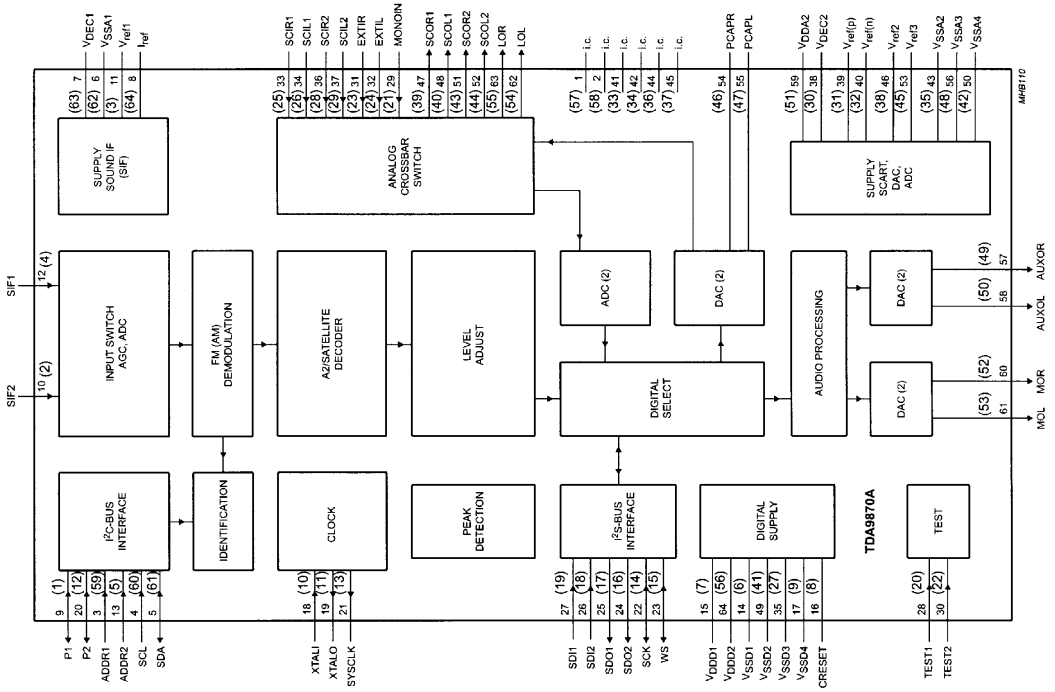
IC801 ST92R195 <CPU>



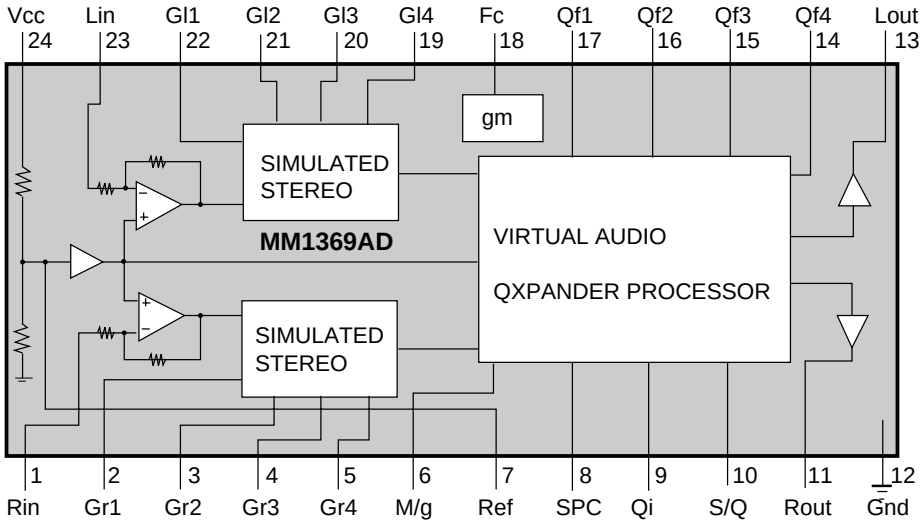
IC1211 MM1313BD <AV Selector>



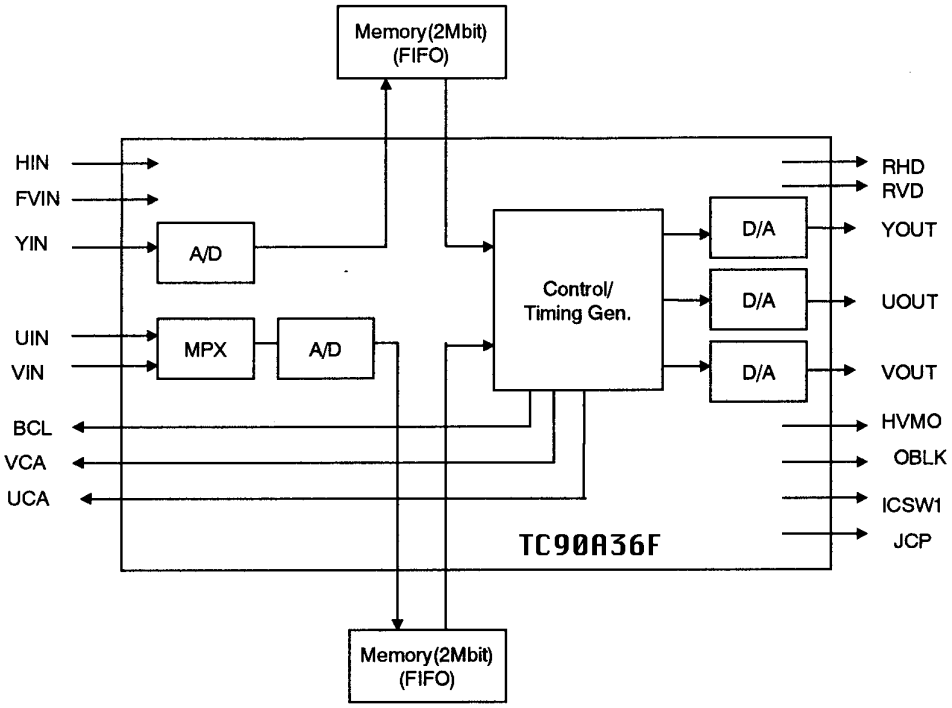
IC3451 TDA9870A <Digital TV Sound Processor>



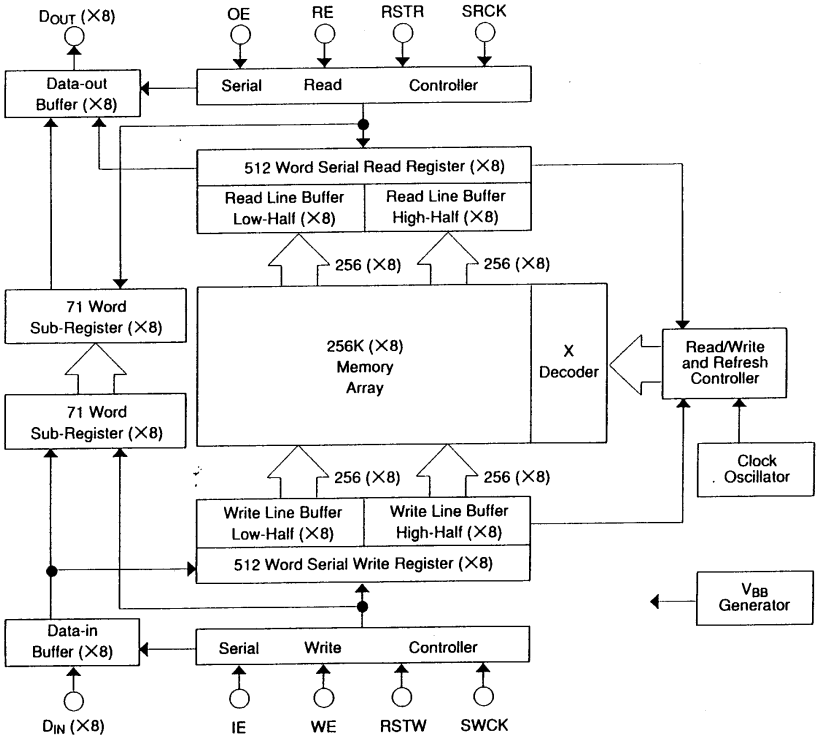
IC3501 MM1369BD <3D Surround Processor>



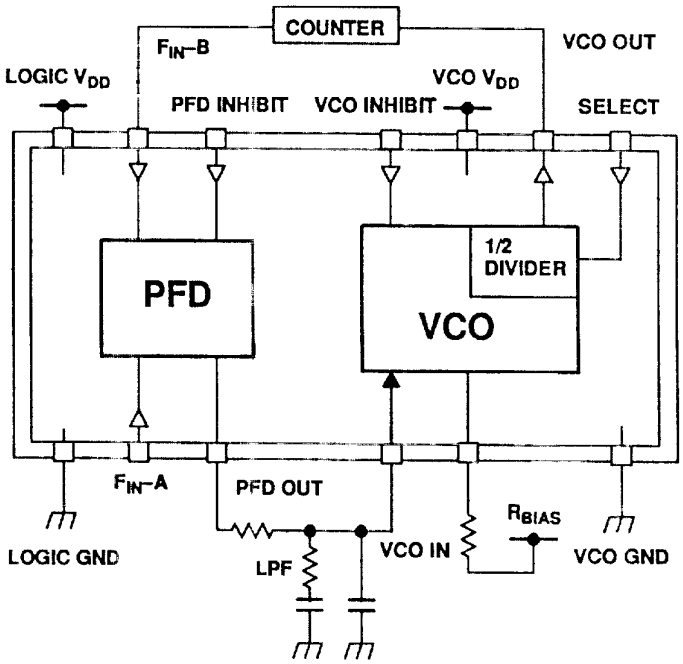
IC7201 TC90A36F <Digital Scan Converter>



IC7202, IC7203 MSM518221A <Field Memory>



IC7204, IC7205 TLC2932 <PLL>



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